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An Exploratory of the Intangible Assets: Methods of Measuring Intellectual Capital

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Abstract**—**The recognition of intellectual capital as a key success factor in determining firm performance has laid the groundwork for scholars to explore methods of measuring intellectual capital. Intellectual capital is defined as a group of knowledge assets that are owned and controlled by an organization that create value. Browsing from previous literatures, there is a plethora of methods to measure intellectual capital. It is evidence that considerable works have been undertaken to identify metrics for measuring intellectual capital. This paper intent to discuss six well-known methods of measuring intellectual capital used to discover its value which is beneficial to firm performance.

Keywords**—** Arguments of measuring intellectual capital, Intellectual capital, Measurement of intellectual capital.

I. Introduction

PERFORMANCE of a firm is closely depends on its intellectual capital, or the ability to manage and utilize knowledge. Scholars agreed that intellectual capital has a positive relationship with performance [14], [27], [9], [16]. [2] added that it leads to a unique and sustainable competitive advantage. Thus, it has gained widespread attention from scholars to explore the dimension of intellectual capital. The more a firm knows about the value of its intellectual capital, the greater the opportunity to gain benefits as it represents the wealth of ideas. This article attempts to discuss on the measurement of intellectual capital to discover its value which is beneficial to firm performance.

II. Intellectual Capital

There are plenty of generic definitions of intellectual capital in the literature and not one established definition amongst scholars existed. This is due to different methods of measuring intellectual capital [8]. Intellectual capital is defined as a group of knowledge assets that are owned and controlled by an organization that create value [4]. It is located in the firms' employees, structure and customer [5]. [13] furthers coined that most scholars treated intellectual capital as being synonymous with intangible assets and highlighted that intellectual capital does have the ability to enhance value, increase profits and consequently create wealth.

Intellectual capital can be classified into three components, namely human capital, structural capital and relational capital [14], [16], [28], [17], [1], [6], [27], [5], [11]. Human capital (HC) refers to the knowledge, abilities, experiences and attitudes possess by the organizational members. It represents knowledge, skills [7], [8], [9], [10], commitments, capabilities and talents which are difficult to imitate, copy, rare and non-replaceable [11]. The second component, structural capital (SC) refers to a collection of knowledge in an organization embedded in systems, databases and programs. It is created by HC to guide employees on the work flow, work culture, rules and procedures in a firm. Finally, relational capital (RC) refers to all the knowledge embedded in the relationships with external parties which include alliances, customers, investors, distribution networks, partners and suppliers. It represents all the knowledge embedded in the relationships with external parties which includes alliances, customers, investors, distribution networks, partners and suppliers.

III. Measurement of Intellectual Capital

The emerging of knowledge economy not only employs measurement systems to evaluate performance but to include a different dimension evaluating intellectual capital as an important resource for growth. Even though there are various methods used to measure intellectual capital, barriers are more likely associated with the identification of appropriate specific measurements based on the fact that the nature of intellectual capital is synonymous to intangible assets.

It is not possible to measure intellectual capital as it is found that researchers in early literatures started to measure intellectual capital based on accounting and financial metrics [18]. Browsing from previous literatures, there is a plethora of methods to measure intellectual capital. It is evidence that considerable works have been undertaken to identify metrics for measuring intellectual capital. [33] have listed 28 methods pertaining to measuring intellectual capital whilst [29] found that there are more than 25 methods. This article will highlight only six well-known methods of measuring

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intellectual capital. They are Economic Value Added, Value Added Intellectual Coefficient, Balance Scorecard, Skandia Navigator Scheme, Intangible Assets Monitor and Bontis Intellectual Capital.

A. Economic Value Added Method

The origin of Economic Value Added (EVA) was dated all the way back to the year 1980 when Alfred Marshall introduced an accounting performance measure called the Residual Income (RI) concept [19]. RI represents the remaining values after all compensation of stakeholders and providers of capital are being paid. Few scholars tried to differentiate RI and EVA, but [22] viewed both are the same method where the latter received more attention after 1993 when Stern Stewart & Company promoted EVA in their consultation business to measure corporate performance [19].

EVA was set to provide an indication of productivity of intellectual capital. It stressed on maximizing incremental earnings over capital cost [20]. Nevertheless, few formulas are found in previous studies using this method. Stern Steward & Company calculated EVA by looking at the differences between a company's net operating income after taxes and its cost of capital of equity and debt [21]. [1] and [22] on the other hand, calculated EVA by deducting net sales from operating expenses, taxes and capital charges.

The complication of using EVA was raised by [32], where Stern Steward & Company uses 164 different areas of performance adjustment to solve problems such as trying to develop the accounting of intangibles and long-term investment that lack a high degree of certainty. These varieties of performance adjustments are likely to end up with meaningless findings as managers will have to engage with a trade-off between complexity, accuracy and ease in making comparisons between companies or over time [22].

Moreover, to get a positive EVA, a firm's rate of return must exceed its required rate of return and therefore it depends on the act of creativity produced by the intangibles. However, it implies no specific measures of intangible assets needed and managers are no better off determining which specific intangible resources contributes to the firm performance [32]. Therefore, using EVA in measuring intellectual capital is arguable when applied to quantifying the value of intangible assets.

B. Value Added Intellectual Coefficient Method

Value Added Intellectual Coefficient (VAIC) is an Austrian method developed by Pulic in the year 1998 [16]. It uses a firm's accounting data, namely then income statement and balance sheet for measuring intellectual capital and its components, and was categorized as financial valuation method. This method was found widely used by researchers to measure intellectual capital of firms in the finance and banking industry [8], [23], [24], [25], [16], [1].

VAIC involves measuring value creation efficiency of intellectual capital. It incorporates both intellectual capital and physical capital in the assessment of an organization's competence for value creation [8]. Merely similar to Bontis Intellectual Capital Method, VAIC divides intellectual capital into three namely Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) and Capital Employed Efficiency (CEE). [8] defines HCE as the indicator of value added by the human resources employed by the business; SCE as the value creation generated by the structural capital; and CEE as the total of the Value Added (VA) generated by the capital employed. VAIC is calculated as shown in Table I [23].

TABLE I
VAIC CALCULATION

No.	Item	Formula
1.	Output	Total income
2.	Input	Cost of bought-in materials, components and services
3.	Value Added (VA)	Output – Input
4.	Human Capital (HC)	Payroll cost
5.	Structural Capital (SC)	VA-HC
6.	Capital Employed (CE)	All the physical and material assets
7.	HCE	VA/HC
8.	SCE	SC/VA
9.	CEE	VA/CE
10.	VAIC	HCE + SCE + CEE

Source: [17]

VAIC has the ability to access financial performance of intellectual capital in a standardized and quantitative measurement. However, VAIC limitation is seen in its inability to measure firms with negative book value of equity or operating profit, which results in a negative value of 'value-added', which carries no meaning [1].

C. Balance Scorecard Method

Balance Scorecard (BSC) was introduced by Robert S. Kaplan and David P. Norton in the year 1992. They stressed on the necessities of balancing four perspectives namely financial, customer, internal business processes, and learning and growth in the firm's strategy management as shown in Fig. 1. BSC seeks to determine the cause and effect relationships between each measure and performance drivers; and every measure and performance drivers must be explained in a given context [20]. The method looks very firm specific, thus carries meaningful results when comparing across firms and industries. However, it was criticized as it does not encompass the intangible assets, because it emphasizes only on balancing each perspective rather than creating value [15].

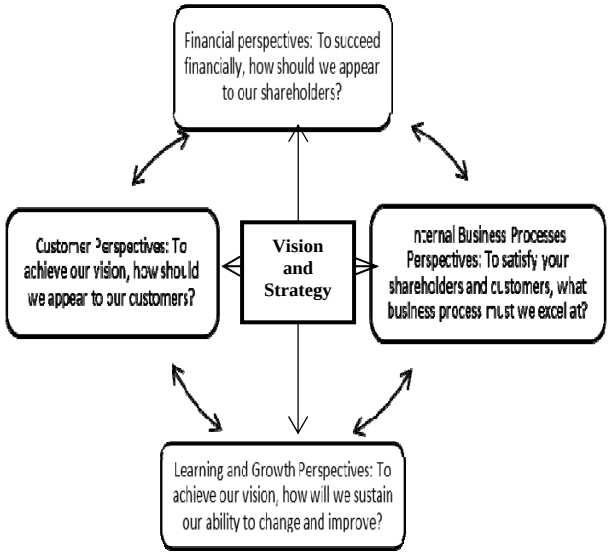

Fig.1 Balanced Scorecard

Source: [19]

D.Skandia Navigator Scheme

Skandia Navigator Scheme or Skandia Market Value Scheme was developed by the Swedish financial services company, Skandia led by Leif Edvinsson [19]. For this Scheme, percentage and ratios represent some extend of monetary measures. It identifies two areas of market values classified as financial capital and intellectual capital ranking at the same level. Human capital is ranked alongside structural capital, due to the logical consideration where people are the contributors to the structural capital. Structural capital is subdivided into customer capital and organizational capital, with innovation capital and process capital falls under organizational capital. Fig. 2 illustrates the model of Skandia Navigator Scheme.

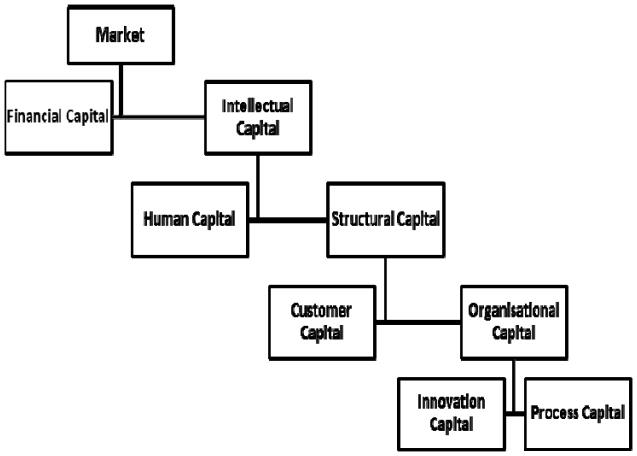

Fig.2 Skandia Navigator Scheme

Source: [13]

The conceptualization of this scheme is to achieve a balance of both financial and non-financial elements visualizing its intellectual capital, reflecting better market value. It involves reporting up to 163 metrics to measure five areas of focus namely financial, customer, process, renewal and development, and human capital making up the Navigation Scheme [22]. Table 2 summarizes some of these metrics.

TABLE 2
SAMPLE OF SKANDIA NAVIGATOR MEASURES

Area	Metric
Financial Focus	Revenue/employee ($) Revenue from new customer/total revenue ($) Profits resulting from new business operations ($)
Customer Focus	Days spent visiting customers (#) Ratio of sales contacts to sales closed (%) Number of customers gained versus lost (%)
Process Focus	PCs/employee (#) IT capacity – CPU (#) Processing time (#)
Renewal and Development Focus	Satisfied employee index (#) Training expense/administrative expense (%) Average age of patents (#)
Human Focus	Managers with advanced degrees (%) Annual turnover of staff Leadership index (%)

Source: [5]

The Skandia Navigator Scheme provides a better appreciation of future value creation where it offers insight on greater opportunity towards an understanding of what and how the employees contribute to value creation. It uses proxy measures of intellectual capital in the assumed value added [3]. However, the measurement of intangible assets can be criticized because it is based on a balance sheet approach where it demonstrates a snapshot in time and cannot represent dynamic flows of an organization [22].

E. Intangible Assets Monitor Method

Intangible Assets Monitor (IAM) was developed by Sveiby in the year 1992. He criticized using money as a proxy for human effort [22] and introduced a new framework containing a knowledge perspective where financial measures to measure visible equity are jointly used with non-financial measure to measure intangible assets, thus resulting a complete indication of financial success and shareholder value as illustrated in Table 3.

TABLE 3
SEEING INTANGIBLE ASSETS

Visible Equity (Book value) Tangible assets minus visible debt	*Intangible Assets* (Stock Price Premium)		
	External Structure (brands, customer and supplier relations)	*Internal Structure* (management, legal structure, manual systems, R&D, software)	*Individual Competence* (education, experience)

Source: [5]

Concerning the IAM, [3] classified intangible assets into three, namely external structure, internal structure and

individual competence. He coined that external structure consists of brands, and customer and supplier relations; internal structure refers to the legal structure, organization's management, manual systems, R&D, attitudes and software; and individual competence includes experience and education. Interestingly, IAM has similar constructs and measures that are labeled differently from other methods. For instance, individual competence also known as HC and internal structure as SC, similar to the Skandia Navigator and the Bontis Intellectual Capital Method.

TABLE 4
SAMPLE MEASURES OF AN INTANGIBLE ASSETS MONITOR

	Intangible Assets		
	External Structure	**Internal Structure**	**Individual Competence**
Growth and Renewal	• Profit/customer. • Growth in market share. • Satisfied customer index. • Quality index.	• IT investments. • Time devoted to R&D.	• Number of years' education. • Competence turnover.
Efficiency	• Sales per employee. • Profit per customer. • Win/loss Index.	• Proportion of support staffs. • Values.	• Value added per employee. • Change in proportion of employee. • Profit per professional.
Stability	• Proportion of large companies. • Age structure. • Devoted customer (repeat orders).	• Age of organization. • Support staff turnover. • Value/attitudes Index.	• Professional turnover. • Relative pay. • Seniority.

Source: [29], [5]

In the IAM conceptual model, Sveiby identified three measurement indicators for each three intangible assets to provide management control in creating shareholders' value namely, growth/renewal, efficiency and stability as illustrated in Table 4. He recommended managers to choose a few of the measurement indicators for each intangible asset depends on the organization's strategy [22].

F. Bontis Intellectual Capital Method

Nick Bontis has developed a different method of measuring intellectual capital. He classified intellectual capital measurement into three; Human Capital, Structural Capital and Relational Capital or Customer Capital and assigned indicators for each classification [26], [27]. The indicators are shown in Table 5.

Bontis Intellectual Capital method presents a more comprehensive picture of a firm's well-being. The method is found capable of measuring intellectual capital even of different level of financial standing existed amongst firms. Also, the method produces more dependable results as it uses different measures for each indicator, avoiding using financial metric to convert each intellectual capital indicators into monetary figures which open critics from several academicians and practitioners.

TABLE 5
INDICATORS OF INTELLECTUAL CAPITAL

Intellectual Capital		
Human Capital	Structural Capital	Relational Capital/ Relational capital
i. Learning and education ii. Experience and expertise iii. Innovation and creation	i. Systems and programs ii. Research and Development iii. Intellectual Property Rights	i. Strategic alliances, licensing and agreements ii. Customer and supplier relations iii. Customer Knowledge

Source: [26]

A growing number of the methods of measuring intellectual capital indicate that the area has evolved. The variations of the methods are due to different accepted definitions of intellectual capital. Each method has its own advantages and disadvantages. This paper has summarized them in Table 6.

TABLE 6
REVIEWS ON THE METHODS OF MEASURING INTELLECTUAL CAPITAL

Method	Advantage	Disadvantage
EVA	Uses 164 different areas of performance adjustment to solve problems such as trying to develop the accounting of intangibles and long-term investment.	The varieties of performance adjustments are likely to end up with meaningless findings as managers will have to engage with a trade-off between complexity, accuracy and ease in making comparisons between companies or over time. Implies no specific measures of intangible assets.
VAIC	The ability to access financial performance of intellectual capital in a standardized and quantitative measurement.	Limitation is seen in its inability to measure firms with negative book value of equity or operating profit, which results in a negative value of 'value-added', which carries no meaning.
BSC	Method looks very firm specific, thus carries meaningful results when comparing across firms and industries.	It was criticized as it does not encompass the intangible assets, because it emphasizes only on balancing each perspective rather than creating value.
Skandia Navigator Scheme	A better appreciation of future value creation where it offers insight on greater opportunity towards an understanding of what and how the employees contribute to value creation where it uses proxy measures of intellectual capital in the assumed value added.	The measurement of intangible assets can be criticized because it is based on a balance sheet approach where it demonstrates a snapshot in time and cannot represent dynamic flows of an organization Arguable when applied using financial metrics to measure intangible assets.
IAM	Financial measures are used to measure visible equity which is jointly used with non-financial measure to	

Method	Advantage	Disadvantage
	measure intangible assets, thus resulting a complete indication of financial success and shareholder value.	
Bontis Intellectual Capital	Capable of measuring intellectual capital even of different level of financial standing existed amongst firms. Method produces more dependable results as it uses different measures for each indicator. Not using financial metrics to convert each intellectual capital indicators into monetary figures. The best choice to use in a situation where there is a barrier to access financial statements.	

Source: Compiled by the Author

IV. CONCLUSION

Different measurement by various scholars evident that there are still attempts to measure intellectual capital. It indicates that the measurement of intellectual capital in the management science would have not yet developed. Nevertheless, they agreed that intellectual capital has effect on performance and measure intellectual capital to determine its potential of creating value, increase profits and consequently create wealth.

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